IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

LITERATURE STUDY ON SOLAR ENERGY RESOURCES – A GEOGRAPHICAL ANALYSIS

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Abstract:

With a population of 1.4 billion and one of the world's fastest-growing major economies, India will be vital for the future of the global energy markets. The Government of India has made its impressive progress in recent years in attaining self-sufficiency in producing green energy through National Solar Energy Mission-2020. Report on India 2020 energy policy review states that India successfully implemented a range of energy market reforms and carried out a huge amount of renewable electricity deployment, notably in solar energy and other renewableincluding wind energy.

It is recognised that India is one among the several countries of the world and has made huge strides to ensure full access to electricity, bringing power to more than 700 million people since 2000. By the end of 2030 India is planned to bring secure, affordable and sustainable energy to all its citizens so that India can make its significant progress in reducing the use of traditional biomass in cooking. The chief cause of indoor air pollution that particularly affects women and children is mainly due to the use of tradition use of fire wood and other carbon emission fuels by relying more on green energy for cooking and other Domestic requirements including irrigation.

The present study reports Literature study on solar energy resources across the globe and its benefits as perceived by the consumers of non-renewable resources during the last decade 2010-2020.

Key words: *Population,Green Energy,National Solar Energy Mission,Air Pollution, Carbon Emission Fuels, Fire Wood, Non-Renewable Resources*

Samuel et.al (2019): "Awareness and use of solar energy as alternative power sources for ICT facilities in Nigerian university libraries and information centres". This paper reports a survey carried out to investigate the awareness and use of solar energy as alternative power source for ICT facilities in Nigerian library and information centres. Descriptive research design using survey method was adopted for this study. Questionnaire was designed and used as survey instrument. The population for this study includes the staff of three Nigerian university libraries. Finally, this study concludes that all the respondents have good knowledge of what solar energy is as they all responded in affirmative.

Ehsanul Kabir et.al (2018): "Solar energy: potential and future prospects". In this article the merits and demerits of solar energy technologies are both discussed. A number of technical problems affecting renewable energy research are also highlighted, along with beneficial interactions between regulation policy frame works and their future prospects. For that they provide a global scenario with regard to solar energy technologies in terms of their potential, present capacity, prospects, limitations and policies. This was help them to expand their understanding on how much further they can count on solar energy to meet the future energy demand. Finally, they concluded that despite a few drawbacks solar energy technology is of the most promising renewable energy sources to meet the future global energy demand

Suhas bannur (2018): "Concentrated solar power in India: current status, challenges and future outlook". In this article, some of the challenges that have inhibited the growth concentrated solar power are identified and possible solutions suggested. The critical challenges for CSP are related to the lack of reliable direct normal irradiance database, indigenous manufacturing and competition from PV. The results of this study carried out to assess the impact of indigenous manufacturing and economics of scale on capital costs and normalised cost of electricity are presented and this study also shows that even with indigenous manufacturing and considering economics of scale, the capital cost per megawatt of installed capacity is higher than the central electricity regulatory commission benchmark costs

Jean Baptiste et.al (2018): "A review of the solar energy situation in Rwanda and Uganda". In this paper authors review the solar energy development and future in Rwanda and Uganda. In these two countries, solar energy sector plays an important role in supporting socio-economic development. The paper examines the development of solar energy market in both countries since their beginnings in the 1980s. This peer review paper also identified that supports from donors, investors and government to promote development of solar energy in these two countries. Finally, the challenges and opportunities facing Rwanda and Uganda in development of solar energy are presented in this study.

Farhard Taghizadeh-Hesary (2018): "Empirical analysis of factors influencing price of solar modules". In this paper authors examined the influence of wage, interest rate, exchange rate and oil price on the price of solar modules for five major solar module producing countries. For that they focused mainly on the consideration of potential economic factors would give us new insights into the mechanism surrounding the recent cost reduction in solar modules. And they concluded using corporate R&D

expenditure as an independent variable may give us a better understanding of the role of solar R&D in reducing technology cost.

Mohd Rizwan et.al (2017): "A review paper on electricity generation from solar energy". In this article authors reviewed about the solar energy from sunlight and discussed about their future trends and aspects. They also try to discussed working, solar panel types; emphasize the various applications and methods to promote the benefits of solar energy. And authors concluded it has more benefits compared to other forms of energy like fossil fuels and petroleum deposits. It is an alternative which is promise and consistent to meet the high energy demand. Research on solar cell and solar energy is promise has future worldwide.

Abdullah et.al (2017): "Solar photovoltaic system: A case study of Akure Nigeria". In this paper authors assessed the level of awareness, adoption and barriers as related to solar PV system in Akure by assessing one hundred and fifty residential buildings randomly with a structured questionnaire administered to the occupants/ owners. The findings revealed that; a large percentage of the residential buildings make use of diesel/petrol generating set as an alternative to the national grid, that the level of awareness of solar photo voltaic is significantly low, the willingness to adopt is high but it's hindered by cost implication of the system. the study findings contribute to the growing literature in the adoption of renewable energy for electricity generation, highlighted the major barriers hindering this effective solution to be proffer. It also provides a prospective market for those interested in the solar energy market.

A. Gangopadhyay et.al (2016): "Wind and solar energy for reducing electricity deficits in Karnataka". In this article the main objective of the authors is to estimate the contributions that wind and solar power could make in reducing expected power deficits in a future year, given the conventional generation that has been planned. So, they estimated the hourly unrestricted demands for a target year, the probability of meeting a large part of the unrestricted demands from conventional sources with, the remainder from wind and solar systems, assuming the availability of a pumped hydro storage system.

Finally, they concluded both for solar and wind power installations for different scenarios and that of the size of PHS are inexact, they are not arbitrary. The method suggested provides guidelines based on available data on load supplies, limited information on peak loads and energy demands for future years and expected installations of conventional sources of power in the future.

Deepak M. Patil, et.al (2016): "Design development of solar tree for domestic applications". In this article load or energy requirement of small house in India is estimated to 1.75 KW hr/day. All the calculations are done considering solar radiation data at Kolhapur, Maharashtra (16760). The load capacities or sizes of all other components of system are determined. And they concluded the solar tree concept is very successful to fulfil the increasing energy demand of the people, saving of land and should be implemented in India to provide electricity without the problem of power cut-off and reduce the dependence on grid power. The overall cost of the domestic solar tree can be reduced by using the available local material. To reduce cost the design of tree structure should be simple and innovative.

Festus akinboro, (2016): "Solar energy installation in Nigeria: observations, prospects, problems and solution". This paper presents review on the technical information on the solar energy stand alone and hybrid installations taking into consideration the various practically encountered problems during installation and operation, and the preferred solutions with more attention being paid to domestic and industrial installation and they concluded independent supply of energy to device in hybrid from help to avoids total or complete breakdown resulting in total blackout in a single shot. This method is recommended for installer of solar energy in an environment similar to Nigeria

Sara Jo viral (2016): "Is solar power a cost-effective energy alternative to traditional energy? A benefit -cost analysis on Tylor country solar facility in Georgia". This analysis focuses on measuring the benefits and costs of this 911- acre solar form and evaluating the net impact to examine whether the predicted negative impact on wildlife populations outweighs the advantages of constructing a solar power plants in Georgia. Additional analysis will incorporate a comparison with traditional energy sources-natural gas and coal, and they concluded the net present values for solar energy compared to coal and natural gas are always positive when using three, six and nine percent social discount rates within a 25-year timeframe.

Moses E. Emetere, et.al (2016): "A simple technique for sustaining solar energy production in active convective coastal regions". This paper seeks to solve the challenges of solar radiation irregularities due to solar shading in the coastal region. It examines a comparative functional analysis of two types of photo voltaic solar panel randomly chosen. The photo voltaic panel was tested in a changing solar radiation noticed in the south west region of Nigeria. A model was propounded to mathematically represent the challenges of solar energy operators in costed areas. It was analytically and numerically proven that climatic factors influence solar radiation in coastal regions. This means that solar photo voltaic efficiency would be greatly affected. The practical solution for enhancing solar photo voltaic efficiency in the coastal areas was suggested via the introduction of electronic concentrator pillars in a proposed solar farm.

Shubojit Dawn (2016)analysed the recent trends in the development of solar energy in India. The study proposes that climate change and its consequences of natural disasters are mainly due to incresed rate of corbon emissions and its outcomes associated with greenhouse effect. The only way to overcome or toreduce this disaster is to cut down the level of greenhouse gases by using green energy resources like solar and wind mill eenergy resources. The encouraging fact is that Global capacity of solar photovoltaic energy generation is increased from 3.7 GW to 177 GW during the time interval of 2004 to 2014 in India.

It is noted that India is abundantly endowed with renewable energy resources (i.e. solar, wind, biomass and small hydro) across the country, and can be exploited through commercially viable technologies to generate power. Increasing use of these sources will also be influential in simultaneously executing environmental objectives, like the reduction of greenhouse gas emission. During the year 2004-2014, Government on India completed 10 solar power projects across several states.

1. Karnataka Solar Park (1600 MW Power capacity)
2. Mahbubnagar Solar Park (1000MW Power capacity)
3. Banaskantta Solar Park (700MW Power capacity)
4. UP Solar Park (600 MW Power capacity)
5. Bhadla Phase II Solar Park (700 MW Power capacity)
6. Bhadla Phase III Solar Park (1000MW Power capacity)
7. Jaisalmer Solar Park (1000 MW Power capacity)
8. Ultra Mega Solar PowerPlant, Rewa (750 MW Power capacity)
9. Anantapur Solar Park (1500 MW Power capacity)
10. Kurnool Solar Park (1000 MW Power capacity)

Jaymin Gajjar et.al (2015):"Solar PV energy generation map Karnataka, India". This study deals with solar photo voltaic generation potential for the Karnataka state. Both annual energy generation and month wise energy generation maps are prepared. The simulation results are closely matching with the actual energy generation data of existing power plants. Authors concluded majority of Karnataka state has very high solar photo voltaic energy potential expect small area in Kodagu district located in south west part of state. This result quite useful to the decision makers and also equally to the solar developers to optimally demarcate the area for solar power plants. It also helps to choosing the area to create larger power plants ex: Solar parks. Choosing a large energy generation area (Sq-ft) is always advantageous from economics point of view.

M.A. Bou-Rabee et.al (2015): "Characteristics of solar energy radiation on typical summer and winter days in Kuwait". In this work authors studied characteristic of solar energy radiation in Kuwait by measuring irradiance and comparing the data of selected time periods in two extreme seasons. The study revealed that the day -to-day variation of irradiance in winter (31%) was approximately 6.5 times higher than in summer (4.8%) clearly, the operation of solar power generation systems in the area during winter would face significant day-to-day fluctuations. As a result, this would necessitate frequent operation of backup power systems in order to meet the electrical power load demand.

Vineeth Atreyash Vasudeva Murthy (2014) in the report India's Solar Energy Future funded by Centre for Strategic and International studies –CSIS analysed the institutional and regulatory framework required for the development Solar energy Parks in India. It is proposed that investment in Solar Energy in India is expected to increase sreadily with the execution of the second phase of Jawaharlal Nehru National Solar Mission (JNNSM-2009).

Jawaharlal Nehru National Solar Mission the National Solar Mission, is an initiative of the Government of India and State Governments to promote solar power in India. Inaugurated in January 2010, the JNNSM has been revised twice and now boasts a target of 100 GW of solar energy by 2022. The objective of JNNSM is to establish India as a global leader in solar energy by creating the policy conditions for its deployment across the country.

In the year 2009 both India and USA signed an MOU to enhance energy security, Energy efficiency, clean energy and Climate Change, which is being executed in three phases under Jawaharlal Nehru National Solar Mission (JNNSM-2009).

Each Phase is supported by differing key policies and targets.

Phase I (2010 – 2013)

: • Target for grid-connected PV (including rooftop) target: 1 000 MW

• Target for off-grid solar PV applications: 200 MW

Phase II (2014 – 2017):

• Cumulative target for grid-connected solar PV (including rooftop): 4 000 – 10 000 MW

• Target for off-grid solar PV applications: 1 000 MW

• Scheme for at least 25 solar parks (34 approved currently under Government) and the Ultra Mega Solar Power Projects to target 40 GW solar PV13th Plan

(Phase III (2017 – 2022)):

• Cumulative target for grid-connected solar PV (including rooftop): 100 000 MW

• Target for off-grid solar PV applications (as share of cumulative): 2 000 MW.

The two countries established a joint clean energy Research and Devekopment centre which supports innovation and private and public particpation in building solar sufficient energy model.

The progress of the three phases of Jawaharlal Nehru National Solar Mission (JNNSM-2009) is depicted as below.

Phase	Time Period	Grid Connected power	Off-Grid Solar Applications	Solar Collectors
Phase 1	2007-2012	11000 MW	200 MW	7 Milllion SqFt
Phase 2	2012-2017	10000 MW	1000 MW	15 Milllion SqFt
Phase 3	2017-2022	20000 MW	2000 MW	20 Milllion SqFt

NikouJavadiEshkalak et.al (2014): "Active solar energy use approaching sustainability". The aim of this research paper is to find suitable and possible ways of photo voltaic and solar thermal collector's building integration in order to increasing energy efficiency without any impact on architectural features. So, they discuss some characteristics about integration of PVs and soar thermal collectors. In order to achieve high quality of integration of these pioneer systems, there must be some specified characteristic and criteria which is suited with specific cases. Thus, they concluded characteristics of each building- location, position of roof/facade, energy need-on one side and the high initial cost of solar active element installation on the other side, considering the type of systems are so important economically and aesthetically.

Elias Sanz.et.al (2014) analysed the production ,consumption and research on solar energy ,the case of German and Spanish. From the study it is observed thatResearch, development and innovation in the field of renewable energy, is closely related to investment and national policies and its GDP growth patterns .The european countries ave made huge amount of investments on order to secure energy reserves and expependiture on conventional sources of energies like Fuel , electricty and coal based power plants.Political decisions on renewable energy in the EU are becoming increasingly important which have stressed that 20% of energy production should come from renewable energy sources by end of 2020.It is further observed that the major factor influencing European countries to adopt to non renewable energy sources is that Solar energy is Eco friendly and significant reductions in emissions of CO2 to the atmosphere.The top 10 countries which have adopted Solar energy as their major alternative source of energy based on the measure of Photovoltaic power per capita in the EU (Wp - Watts peak) islisted as below.

	Country	Wp (Watts peak)/inhab
1	Germany	120.2
2	Spain	76.4
3	Luxembourg	52.4
4	Czech Rep	44.3
5	Belgium	35.3
6	Italy	17.1
7	Portugal	9.6
8	Greece	4.5
9	Austria	4.5
10	France	4.5

Source : EurObservER 2010

C.Hemalatha et.al (2014): "Advancement in solar panels and improvement in power production with indoor applications". In this paper the implementation of solar panels in indoor application with the consideration of effective utilization of the waste energy from lighting sources in household areas are considered. The thought of energy management should be started off from the base example from our homes has taken this project an overcome of the drawbacks in the lightings in which much of its energy is wasted in IR and UV, rather than using as visible light.

Srinivasan Chinnammai (2014): "A study on energy crisis and social benefits of solar energy". In this paper author examines the short fall of energy and also it is finding out the social benefit of the solar energy utilization. For that he made to review the literature on the subject of solar energy, to understand the varied perspectives on conventional energy scenario, power development and its present position, and to understand renewable energy in general terms and solar energy in particular. And he concluded solar energy is a best energy fir human life.

Berry den Hartog (2014)explored factors that hamper or boost photovoltaic energy development India. The Research report finds that India, being a tropical country receives adequate solar radiation for 300 days, amounting to 3,000 hours of sunshine equivalent to over 5,000 trillion kWh. Almost all the regions receive 4-7 kWh of solar radiation per sq mtrs with about 2,300–3,200 sunshine hours/year, depending upon the location. Many potential solar photovoltaic areas are available which could make photovoltaic a great addition to the current energy mix. According to the annual reports of Ministry power and Ministry of Non renewable Energy Resources -2014 it is found that India has the potential to generate 35MW per square kilometer using solar photovoltaic and solar thermal energy. The currently generate electricity is 210.951 GW as of December 2012, from where 33% is generated from renewable energy resources.The biggest need in the Indian energy sector is to improve management of the power sector, especially governance of distribution entities ,including Urban development authorities in tems of the interferences from middlemen and political agencies while developing photovoltaic technology systems and its distribution .It is observed that there is need to make it mandatory for all the construction builders/Architects to follow and implement solar energy guidelines so that all domestic energy requirements are met.

K.R. Ajao et.al (2013): "Determination of the optimal tilt angle for solar photovoltaic panel in Ilorin, Nigeria". This study determines the optimal tilt angle for solar photovoltaic system in Ilorin, Nigeria was carried out. The result obtained shows that the average optimal tilt angle at which a solar panel will be mounted for maximum power performance at fixed position in Ilorin is 220. This optimum angle of tilt of the solar panel and the orientation are dependent on the month of the year and the location of the site of study. The power generated by a solar panel is dependent on the angle at which is tilted, the prevailing weather condition and the orientation of the solar panel. Improper orientation of the solar panel would eventually lead to loss in power and poor return on investment.

Michal et.al (2013): "Exploring the economic and environmental benefits of solar energy generation in developing countries: The Nigerian perspective". This paper examines the economic and environmental benefits of solar energy generation in Nigeria and also evaluates the economic and environmental viability of the sun's potential to generate electricity power for majority of the residents of Nigeria. In this article he concluded Nigeria has numerous conventional energy resources. Due to mismanagement and corruption, it has often been forced to import virtually most of its energy requirements. It is not necessary to belabour the point by stating thet importation of petroleum oil represents a significant drain on the nation's economy and a depletion of foreign exchange. These problems should therefore create a very strong incentive to develop domestically available renewable resource. Solar energy has been a defined, as perhaps the best near indigenous resource to meet the energy needs of this great giant country.

Anik deb et.al (2013): "Prospects of solar energy in Bangladesh". This research paper is based on the prospects of solar energy from perspective of Bangladesh. Possible implementations of solar technologies like photovoltaic cells and solar thermal energy are discussed with their optimum capacity efficiency, storage facilities and cost per unit power. Some social, economic and environmental constraints regarding the implementation of solar technology are highlighted and some possible solutions are offered.

Rahul Rawat et.al (2013): "Simulation and optimization of solar photovoltaic- wind standalone hybrid system in hilly terrain of India". The main objective of this paper is to utilize the available wind and solar resource to meet the energy needs of residential/institutional buildings in western Himalayan Indian state of Himachal Pradesh. A 6-kwh solar-wind hybrid system installed on the roof top of an institutional building is analysed and optimized used HOMER software at different reliability levels. The total electricity production by the system is found to be 1996 kwh/yr. with cost of energy as $1.156/kwh. The techno -economic characteristics of existing and optimum hybrid system configuration with 0%,5%,10 and 20% maximum capacity shortage are studied. The result indicate that solar and wind resource can be utilize economically using solar-wind hybrid energy systems for decentralized applications in the western Himalayan complex terrain.

P. Nagalakshmi et.al (2013): "Efficient energy management system with solar energy". In this paper introduced an efficient energy distribution system to distribute the energy generated from the renewable sources. In order to meet the current problems, the energy generated from the renewable sources to maintain it constant. It was connected to a battery and inverter. In this research they have implemented a proto type system for the ideas. The preliminary tests show that this approach is promising for real applications. They concluded the problem with this system is that to require huge inverter to store the largely variable solar energy and its maintenance. His can be overcome by constructing solar grids parallel to the existed grids by the government.

Ganesh Hegde et.al (2012):"Scope for solar energy in Kerala and Karnataka". Karnataka and Kerala states are dependent mainly on conventional energy source such as diesel, coal, gas and hydro energy. Only 4 % of total installed plant capacity is based on renewable energy sources in Kerala and 24% in Karnataka. However, both the states get very good solar insolation solar energy utilization is not remarkable. Subsequently both states facing the electricity defect problem. Soler energy harvesting could lead to the solution. In this paper authors discusses the electrical energy harvesting from solar energy in the available wastelands in the states. And they concluded harvesting of solar energy in waste land could meet the present as well as future demand in both the states. Since solar energy is cleaner and renewable source pollution and energy deficiency problem can be eliminated.

Shakir-ul haque Khan (2012):"A brief study of the prospect of solar energy in generation of electricity in Bangladesh". In this paper author examines the average annual sunlight hours in Bangladesh and was compared with developed countries like Germany and Spain, which are notable for their development in renewable energy sector. Possible implementable solar technologies like concentrating solar power, PV and integrated solar combined cycle are discussed with their optimum capacity efficiency, storage facility and cost per unit power. Some social, economic and environment constraints regarding the implementation of solar technology are highlighted. And some possible solutions are offered

- Social awareness should be built up by running media awareness programs like talk shows and arranging seminars, especially in colleges and universities to motivate the young generation.
- Reduced taxes and removal of any tariffs on accessories vital to this sector could help deduce the expense to a reasonable level.
- Government can provide financial incentives, aid packages, offer technical and legal support and even subsidize organizations dealing or wanting to setup in the solar sector.

Gagari Deb et.al (2012): "Use of solar tracking system for extracting solar energy". In this paper authors deals with the design and execution of a solar tracker system dedicated to the PV conversion panels. In this paper mechanism of building an efficient solar tracking system with the help of lab view software is discussed and also discussed about the control strategy of the stepper motor. Finally, they concluded by using this circuit the solar array can be rotated in required direction following the sun path to get maximum energy from the sun with the help of this lab view program the efficiency of the solar panel would be increased. Again, use of this technique can capture large amount of solar energy. For this reason, the use of the non-conventional energy will increase which is very fruitful incident of our future power sector.

Fudeliu et.al (2012): "working principles of solar and other energy conversion cells". In this review article, the authors addressed the issues regarding energy conversion cells in a fresh and broad perspective. The authors checked different energy conversion paths from solar energy to electrical energy and showed a simple picture of energy conversion. The authors then went through the working principles of solar cells in terms of charge carrier's generation, separation and transport/ collection. The comparison between different energy conversion cells, including solar, thermoelectric, and electrochemical and photo electrochemical cell by exploring the working principles of each kind of these cells was studied. It was shown that the working principles behind these cells are quite similar, following a simple energy conversion picture. The aim of this article is to explore the close connections between different energy conversion cells and the essence behind.

Naveen Kumar Sharma (2011):"Solar energy in India: Strategies, policies, perspectives and future potential". In this paper, efforts have been made to summarize the availability, current status, strategies, perspectives, promotion policies, major achievements and future potential of solar energy options in India. Thus, he concluded India has a severe electricity shortage. It needs massive additions in capacity to meet the demand of its rapidly growing economy. Development of solar energy, which is indigenous distributed and has low marginal cost of generation, can increase energy security by diversifying supply, reducing import dependence and mitigating fuel price volatility. So photovoltaic power systems will have an important share in the electricity of the future not only in India, but all over world.

T.V. Ramachandra et.al (2011):"Hotspots of solar potential in India". This paper evaluates the progress made in solar power generation in the country especially with the inception of n ambitious National Solar Mission also termed as 'solar India'. Organizational aspects of solar power generation with focus on existing policy elements are also addressed so as to probe the actual potential of the identified solar hotspots in meeting the NSM targets and beyond. Authors identified the solar hotspots in India using high resolution satellite data. They observed that nearly 58% of the country receives annual average global insolation of 5kWh/m^2/day. The solar power technologies like SPV and CSP havebeen discussed with focus on their techno-economic constraints of implementation. Finally,authors concluded solar hotspots in India have the potential to offset a huge volume of GHG emissions as demonstrated and help realize a low carbon economy at a faster rate. It will create numerous employment opportunities especially in the village level.

R. Hosseini et.al (2011): "An experimental study of combining a photovoltaic system with a heating system". In this experimental study combination of a PV system cooled by a thin film of water with an additional system to use the heat transferred to the water has been considered. Experimental measurements for both combined system and conventional panel indicate that the temperature of the photovoltaic panel for combined system is lower compared to the conventional panel, the results show that the power and the electrical efficiency of the combined system are higher than the traditional one. Also, since the heat removed from the photovoltaic panel by water film is not wasted, the overall efficiency of the combined system is higher than the conventional system.

James Hamilton (2011): "careers in solar power". This article provides information on the process of generating solar power and details various occupations in the solar industry. The first section details a brief history of solar power in the United States, followed by an overview of how solar power is generated, which entities use it and the technology involved in supplying solar power. The second section provides occupational information highlighting a brief job description of several noteworthy occupations that are related to solar power; the credentials needed to work in the occupation, such as education, training, certification or licensure and wage data. Finally, he concluded lean energy such as solar power is expected to be a key piece of the growing "green economy", and jobs in solar power show great potential for new employment opportunities.

Damon Turney et.al (2011): "Environmental impacts from the installation and operation of large -scale solar power plants". In this paper authors develop an improved understanding of the environmental impacts of the installation and operation phases of solar power. They identified and appraise 31 impacts related to issues of land use, human health and well-being, wild life and habitat, geohydrological resources, and climate their analysis accomplishes the following 1) identifies impacts, 2)assesses each impact relative to traditional power generation, 3) classifies each impact as beneficial or detrimental,4) appraises the priority of each impact. The results form a comprehensive description of the impacts of installation and operation of solar power, in a variety of climates and afford a first picture of the impacts of solar power in forested regions

Chikaire et.al (2010): "Solar energy applications for agriculture". This paper discusses briefly the various applications of solar energy technologies in agriculture. They outline some applications of solar energy technologies used in agriculture. Finally, they concluded agriculture technology is changing rapidly, farm machinery, farm buildings and production facilities are constantly being improved. Cheaper and improved source of energy are needed for efficient and smooth operations of the facilities. These sources of energy are clean, risk free and constitute no harm to man and environment.

Mark. Z. Jacobson et.al (2010): "Providing all global energy with wind, water and solar power, part 1: technologies, energy resources, quantities and areas of infrastructure and materials". In this paper authors analyse the feasibility of providing worldwide energy for purposes from wind, water and sunlight. In part one they discuss WWS energy system characteristics, current and future energy demand, availability of WWS resources, number of WWS devices and area and material requirements. In part two they address variability, economics and policy of WWS energy. Finally, they suggest producing all new energy with WWS by 2030 and replacing the pre-existing energy by 2050.

Global climate & energy project GCEP energy assessment analysis summer (2006): "An assessment of solar energy conversion technologies and research opportunities. This report summarizes the states of the research in some mature and emerging solar technologies with high potential for large scale energy production and identifies fundamental research topics that are crucial for improving their performance, reliability and competitiveness.

Andlinger centre for energy plus the environment (2006):discussed theinformation relevant to the intriguing question of whether the large and small projects characterizing current solar power will be sustained in the future. They also discuss "distributed generation", which may conceivable become the basis of a restructuring of the current centralized utility. The article concluded with a description of some imaginative use of solar collectors in buildings, where the production of electricity is a side objective.

Theo Charis Tsoutsos et.al (2005):"Environmental impacts from the solar energy technologies". In this paper authors present an overview of an environmental impact assessment. They assess the potential environmental intrusions in order to ameliorate them with new technological innovations and good practices in the future power system. This analysis provides the potential burdens to the

environment, which include- during the construction, installation and the demolition phases. As well as especially in the case of the central solar technologies-noise and visual intrusion, greenhouse gas emissions, water and soil pollution, energy consumption, labour accident, impact on archaeological sites or on sensitive ecosystems, negative and positive socio- economic effects. They concluded an environmental impact assessment for central solar systems, which should estimate the magnitude of potential environmental impacts and propose appropriate mitigation measures can play a significant role to proper project design and to a subsequent project public acceptance.

Research gap:

From early literature studies it is found that India is marching towards self-sufficient, self-reliable in terms of its energy requirements by adopting various guidelines issued by ministry of power and renewable energy resources. When Karnataka and its tropical regions are considered we have only one solar park as it is reported in 2014. However there is a large scope of applications and consumer demand both from domestic and agriculture sectors of the state. There is very little research is reported so far in terms of both supply and demand analytics and the geographical spread of the tropical territorial zones where solar energy can be generated. At the sometime little amount of awareness is spread and prevailed among the prospective house builders as well as agricultural requirements. There should be both technical and marketsupportfor the evolution of sustainable green energy production and its applications among the people of Industry, Urban development authorities, Government incentives at the higher scale for the Domestic consumers.

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